

BMNR

342.4

546.1

1388

2064

File copy

UNITED STATES DEPARTMENT OF AGRICULTURE  
 AGRICULTURAL RESEARCH ADMINISTRATION  
 BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE  
 Division of Forest Insect Investigations

Project I-C-8

Date 6/24/53

Author Ralph C. Hall

FURNISS	RLF
WHITESIDE	W.13
BUCKHORN	for
WEAR	
McCAMPBRIDGE	KHIO
WRIGHT	WKD
COULTER	

## TITLE

SPECIAL REPORT BK-21

THE CONTROL OF THE PINE REPRODUCTION WEEVIL  
 ON THE SHASTA AND LASSEN NATIONAL FORESTS  
 THROUGH AERIAL APPLICATIONS OF DDT

FOREST INSECT LABORATORY  
 29 FORESTRY BUILDING, U. S.  
 BERKELEY 4, CALIFORNIA

NOT FOR PUBLICATION WITHOUT PRIOR APPROVAL OF  
 THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE  
 OR FOR USE IN SALES PROMOTION OR ADVERTISING  
 WHICH EXPRESSLY OR IMPLIES ENDORSEMENT OF THE  
 PRODUCT BY THE BUREAU OR THE U. S. DEPARTMENT  
 OF AGRICULTURE.

THE CONTROL OF THE PINE REPRODUCTION WEEVIL  
ON THE SHASTA AND LASSEN NATIONAL FORESTS  
THROUGH AERIAL APPLICATIONS OF DDT

By

Ralph C. Hall

Summary

A control project, using an airplane to apply DDT oil spray at the rate of one pound per gallon per acre, was undertaken against the pine reproduction weevil between June 17 and 20, 1952 by the U. S. Forest Service, with technical assistance by the Berkeley Forest Insect Laboratory. Control was carried out on about 2,000 acres of the Mount Shasta brushfield planting on the Shasta National Forest and on a 500 acre portion of the Burney Springs brushfield planting on the Lassen National Forest. In both of these areas, the reproduction weevil had caused very serious damage in 1951 and threatened to continue its depredations in 1952 unless controlled. The following results were achieved:

1. In the Shasta field, the infestation was reduced by about 72 per cent.
2. In the Burney Springs field, the infestation was reduced by about 81 per cent.
3. A small experimental planting in a portion of the Shasta field was protected from spraying and the infestation in this local area was increased about 300 per cent.

Introduction

The pine reproduction weevil, Cylindrocopturus eatoni Buch., is a very serious pest in brushfield plantings of ponderosa and Jeffrey pines in northern California. It was responsible for the almost complete destruction of a large planting in the Big Springs brushfield on the Lassen National Forest between 1938 and 1940. It very seriously threatened portions of the Mount Shasta brushfield planting on the Shasta National Forest and the Burney Springs planting on the Lassen National Forest in 1946. In the spring of 1947, experimental spraying in these two plantings using a variety of methods including the airplane gave temporary relief; but in 1950 infestations of epidemic proportions again were found in portions of the Burney Springs area and a new infestation was found in the Plummer Ridge planting on the Eldorado National Forest. These were controlled in 1951 by the use of DDT applied from a helicopter.

During the same year, a serious infestation developed in parts of the Mount Shasta and Burney Springs brushfields, principally in plantings where control previously had been conducted. A survey showed an average infestation of about 33 per cent in the Mount Shasta area and about 37 per cent in the Burney Springs

area. Since previous work had demonstrated that the airplane gave equally good results in comparison with the helicopter at about one-third the total cost, control by airplane spraying with DDT was recommended on about 2,000 acres in the Mount Shasta planting and 500 acres in the Burney Springs area on November 5, 1951. This recommendation was favorably received by the Forest Service and during the spring of 1952, a working plan for the project was prepared by Hall<sup>1/</sup> and control measures subsequently were applied. It is the purpose of this report to present the results of this work.

#### Cooperation and Personnel

The 1952 program was a cooperative project between the Forest Service and the Bureau of Entomology and Plant Quarantine. The Forest Service supplied all the spray materials, the airplane, labor for mixing and loading the spray materials and for flagging the area, as well as portable radio equipment. The Bureau's Forest Insect Laboratory, Berkeley, California, provided the technical supervision for the project and was responsible for checking the results. C. W. Corson of the Forest Service Regional Office directed the activities of the Forest Service and Ralph C. Hall of the Forest Insect Laboratory directed those of the Bureau, assisted by M. M. Furniss and R. Z. Callahan.

#### Control Objectives

The general objectives on this project were two-fold: (1) to kill as many adult weevils as possible prior to the time of oviposition, through the contact effect of the spray, (2) to protect the uninfested trees through the residual effect of DDT, which on the basis of previous experience, was expected to remain for a period of about two months.

#### Method of Treatment

In view of the experience gained in two previous aerial control projects with this insect, the following spray formula was used in the present work: 1 pound of DDT dissolved in 1 quart of Velsicol AR50 plus enough diesel to make one gallon of finished spray. This solution was applied at the rate of one gallon per acre. The height of flight was about 30 feet above the trees, and the width of strip 1 chain (Figure 1). The airplane used was a Noorduyn Norseman with a 650 horse power Pratt Whitney engine. This plane was equipped with a spray tank having a capacity of 220 gallons, a centrifugal spray pump (make L-C-D model 851) and a boom to which were affixed two rotor wire brush-type spray nozzles (Figure 2). The airport used for the Mount Shasta planting was at Montague, about 30 miles north. The airport for the Burney Springs planting was at Fall River Mills, about 28 miles north-east. Spraying was confined to the early morning hours from dawn to about 10:00 a.m.

---

<sup>1/</sup> Working Plan for the Control of the Pine Reproduction Weevil in Brushfield Plantings on the Lassen and Shasta National Forests by the Use of the Airplane, by R. C. Hall, Berkeley Forest Insect Laboratory Report June 4, 1952.

### Areas Treated

#### Shasta National Forest

The area treated on the Shasta National Forest included all of Mount Shasta brushfield where planting had been successful, or a total of about 2,000 acres. This area was treated on June 17 through 19, 1952.

#### Lassen National Forest

The area treated on the Lassen National Forest was a portion of the Burney Springs planting covering compartment P-55-37 and P-69-39 with a total of 500 acres. This area was treated on June 20, 1952.

### Checking the Distribution of the Spray

The distribution of the spray was checked through the use of circular filter papers and jump cards distributed at random throughout the treated area (Figure 3 and 4). The filter papers were sent to the Beltsville, Maryland Forest Insect Laboratory where they were analyzed to determine the amount of DDT deposit per acre. On the basis of a visual appraisal of the jump cards, it was estimated that droplet size varied from 100 to 500 microns, with the average of 200 microns. The estimated deposit from the jump cards in the Burney Springs area was 0.32 pounds per acre, compared to 0.24 from the chemical analysis. In the Mount Shasta area, it was 0.46 pounds per acre compared to 0.25. These recovery values are considerably lower than those obtained in the past two aerial spray control projects.

### Cost of the Spray

The cost of spraying was as follows:

Spray Material	\$1.04 per acre
Airplane Rental	.10 per acre
Total	\$1.14 per acre

The cost of similar control work undertaken in 1947 was \$1.11, with airplane rental \$0.36 and spray material \$0.75. This compares to about \$2.85 per acre for the helicopter spraying in 1950, where spray material cost was \$0.85 and helicopter rental \$2.00.

### Effectiveness of the Control

Approximately 1,000 trees were examined at the time of spraying in the Mount Shasta planting to determine the 1951 weevil-caused mortality. It was found that 33 per cent of the trees were killed by the weevil during that year. In May 1953, a check of 872 of the surviving trees showed that weevil-caused mortality in 1952 was only 9.2 per cent. This amounts to a reduction of about 72 per cent.

In the Burney Springs planting, 500 trees were sampled in 1951, and 37 per cent were found to be infested. A check of 331 of the surviving trees in May 1953 showed 7.0 per cent infested in 1952 or a reduction of about 81 per cent.

In both the control areas, the reduction in loss was not as great as that obtained in previous control work. The only check available on either of the present control jobs was an experimental hybrid planting in a portion of the Mount Shasta brushfield. These trees were covered with large paper bags at the time of the application of the spray, so that they might continue to yield information on the relative resistance of hybrids versus parent stock. In 1951, there were 7 trees killed out of a total of 176, or 4.0 per cent infested. In 1952, there were 26 trees killed or 15.4 per cent infested. This represents an increase in damage of 271 per cent over the previous year. If we can assume that the same ratio of increase would have occurred in the balance of the area had the spray not been applied, then the results would be more striking, for control due to spraying would have been more than 90 per cent effective in both plantations.



Figure 1. The Forest Service Noorduyn plane applying spray at the rate of one pound per acre in the Shasta brushfield planting at 5:35 a.m., June 19, 1952. The height of flight is about 30 feet.



Figure 2. One of two wire brush type of spray nozzles used on the Noorduyn plane for applying DDT.

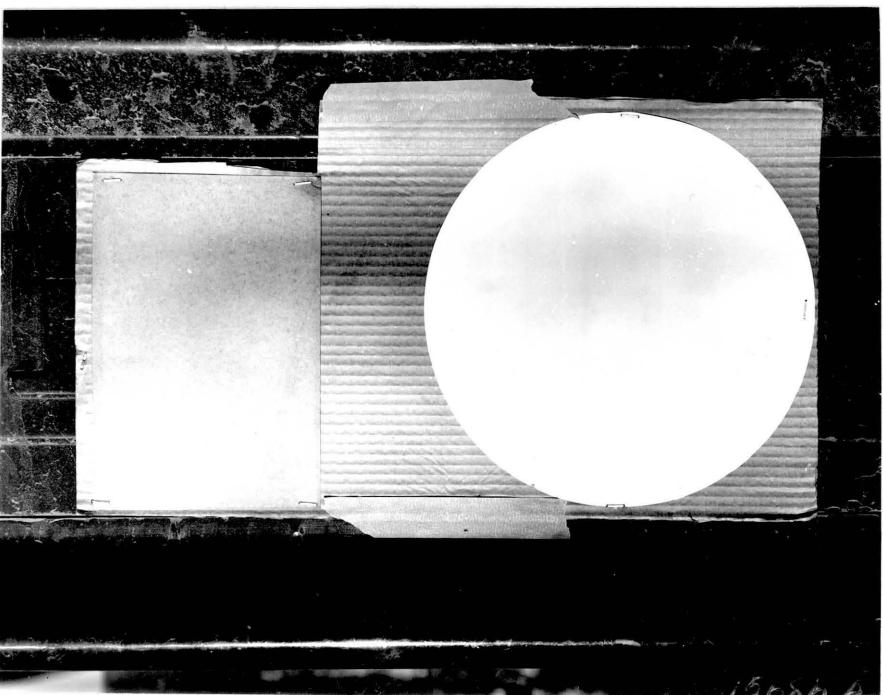


Figure 3. Circular filter paper on left and jump card on right used to check the distribution of DDT spray in the field - reduced about 4.5 times.

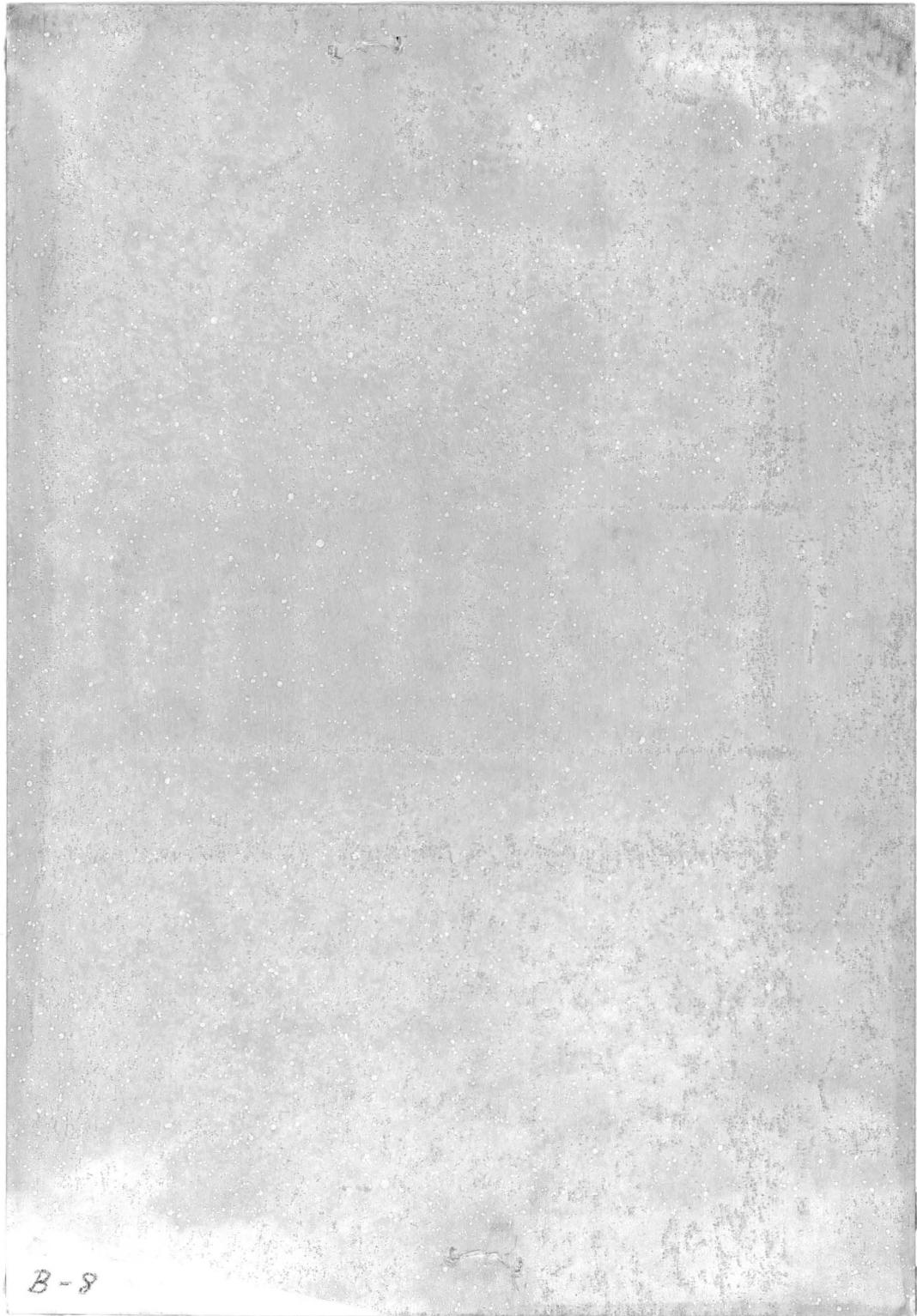


Figure 4. A sample of one of the jump cards showing the distribution of the spray and droplet size from the Shasta field.



Figure 5. Experimental planting to test the relative resistance of Jeffrey-Coulter hybrid to attack and injury by the reproduction weevil. The trees were covered with paper bags to protect them from DDT spray. Shasta Field.